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THE ART UNION

THE OFFICIAL JOURNAL OF THE AMERICAN ART UNION

VOL. 2.

NEW YORK, NOVEMBER, 1885.

No. 5.

AN ESSAY ON THE EDUCATION OF THE EYE WITH REFERENCE TO PAINTING.

By JOHN BURNET, F.R.S.,

AUTHOR OF "PRACTICAL HINTS ON PAINTING."

PART I.

(Continued from last month.)

MEASUREMENT.

TO teach the eye to measure the distance between one object and another ought to be the first proceeding; the forms of the lines which bound these spaces, the shapes contained or excluded by such lines ought to follow, for as the eye must have something tangible to work upon, it ought to be simple and evident. I should, therefore, commence by a series of dots or points, first two, then three, four and five; also, the angles made by drawing lines from each several point. A pair of compasses will enable anyone to compare their correctness with the original, for until a pupil can accomplish pretty correctly these preliminaries it is useless to hasten to more complicated matters. (Figure 1.)

FORM.

All forms containing more or less portions of a triangle, square or circle the eye must be taught to comprehend and imitate such objects in their simple forms, in order to fit it for the purpose of seeing such qualities when mixed and confined with more complicated figures. I would recommend these forms to be cut out in paper and viewed in various situations, being set upright, and also viewed in a horizontal position, that the eye may become thoroughly acquainted with the figures in all their variety of shapes and with the causes of their alterations in form. I would also recommend the pupil to draw from a cube and a ball, that the eye may become early accustomed to draw from the real

objects in place of flat surfaces, which will give him a power in drawing from nature, unattainable by any other method. (Figures 2, 3, 4, 5, 6, 7.)

PERSPECTIVE.

Many have been deterred from attempting to learn drawing from the dread of encountering so formidable a department of the art as perspective; whereas, if it is stripped of its geometrical and mathematical intricacies it will be found a very simple matter and easy of comprehension.* Perspective, as the word

* "Long calculations or complex diagrams affright the timorous and unexperienced from a second view, but if we have skill enough to analyse them into simple principles, it will be discovered that our fear was groundless. Divide and conquer is a principle equally just in science as in policy. Complication is a species of confederacy which, while it continues united, bids defiance to the most active and vigorous intellect, but of which every member is separately weak, and which may, therefore, be quickly subdued if it can be broken. The chief art of learning, as Locke has observed, is to attempt but little at a time; the widest excursions of the mind are made by short flights, frequently repeated." Dr. Johnson.

denotes (being a compound of the Latin words *per*, through, and *specto*, to view), is the art of drawing the several objects as they appear when traced upon a glass or transparent medium; the art of drawing in perspective, therefore, is nothing more than representing the various objects subject to those laws which regulate their appearance in nature.†

LINES.

All lines are subject to an alteration in their appearance except two, a perpendicular line and

a horizontal one; and lines are more or less diminished in length according as they depart from the parallel of the base line; for example, if a person holds a pen or stick parallel with the eyes, and gradually turns it round, he will see it gradually become shorter, until it assumes a mere spot when it is placed with the point directly towards the eye. As it then covers what is termed the *point of sight*, being a point immediately opposite the observer's eye, and upon the horizontal line, which is always of the

height of the eyes of the spectator; and as it is turned round it will describe innumerable points along the whole line; these are termed *accidental points*, and vary according as the lines run more or less at right

angles from the base line. Lines also vary according as they are situated above or below the observer's eye; for instance, if a book is held up horizontally before the eye, the under cover will be seen when held above, and the

lines of its sides appear to run down to a point on the horizontal line. When underneath the eye, the upper cover will be seen, and the lines describing the sides appear to rise up to the hori-

Fig. 3.

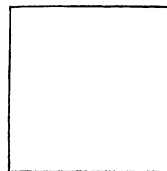


Fig. 4.

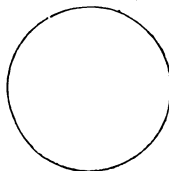


Fig. 5.

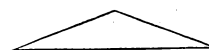


Fig. 6.

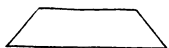


Fig. 7.



† "It was in the sixteenth century that *Perspective*, a new branch of optics, was revived, or rather invented; this is more a business of *geometry* than optics, and is indeed more an art than a science; but since it is derived from optical principles, and as the use of it is to give pleasure to the eye by a just representation of natural objects, I would do wrong not to give a short account of its rise and progress. The art of perspective owes its birth to painting, and particularly to that branch of it which was employed in the decoration of the theatre, where landscapes were principally introduced, and which would have looked unnatural and horrid if the size of the objects had not been pretty nearly proportioned to their distance from the eye. We learn from Artruvius that Agatharchus, instructed by Eschylus, was the first who wrote upon the subject, and that afterwards the principles of this art were more distinctly taught by Democritus and Anaxogoras, the disciples of Agatharchus. Of the theory of this art, as described by them, we know nothing, since none of their writings have escaped the general wreck that was made of ancient literature in the dark ages of Europe. However, the revival of painting in Italy was accompanied by a revival of this art. The first person who attempted to lay down the rules of perspective was Pietro del Borgo, an Italian. He supposed objects to be placed beyond a transparent tablet, and endeavored to trace the images which rays of light emitted from them would make upon it; but we do not know what success he had in this attempt, because the book which he wrote upon the subject is not now extant. It is, however, very much commended by the famous Eganvo Dante; and upon the principles of Borgo, Albert Durer constructed a machine, by which he could trace the perspective appearance of objects. Balthazar Perussi studied the writings of Borgo, and endeavored to make them more intelligible; to him we owe the discovery of points of distance, to which all lines which make an angle of 45 degrees with the ground line are drawn. A little time after, Guido Ubaldi, another Italian, found that all lines that are parallel to one another, if they be inclined to the ground line, converge to some point in the horizontal line, and that through this point also a line drawn from the eye parallel to them will pass. These principles put together enabled him to make out a pretty complete theory of perspective."—*Priestley's Optics*.

Since then the *Jesuits' Perspective*, *Brook Taylor's*, *Malton's* and others have rendered the most difficult and intricate diagrams clear and comprehensive.

zontal line.* (Figure 8.) Before proceeding further, for the better understanding of the several lines already mentioned, and showing how they are affected, I shall give an explanatory figure. Figure 9 represents a cupboard with folding doors; being placed immediately before the eye, the sides appear to rise and descend to the point of sight, A; also the door, B, from its being opened at right angles with the base line, while the lines of the door, C, appear to run to the accidental point, D. This point will vary its situation according as the door is more or less opened, which explains what are termed accidental points.

DIMINUTION.

All objects diminish in size as the spectator departs from them, hence two parallel lines seem to approach each other as they recede from the eye; and this diminution will appear more or less sudden, according as they commence from a near point or one more removed; for example, if the hand is held near the eye it will intercept a larger space than when held out at arm's length. Objects diminish in an increased ratio until removed to a certain distance, when the diminution appears less violent; this may be made apparent by diagram 10. Let the line A represent the spectator, and the line B represent a line of pavement, the circular line, C, which cuts through the visual rays (imaginary lines reaching from various objects to the eye), as they approach the eye, will show the diminished ratio as the squares become more distant; and as they have to be represented upon a plain surface, their proportions will be as the divisions on D, they will therefore present the appearance of Figure 11 to the eye. When, therefore, objects are commenced too near, they appear out of proportion with the other objects in the work, and though true according to rule, appear false with regard to their effect on the eye of the spectator. This is termed violent or sudden perspective, to avoid which a point of distance is chosen that will look agreeable. The breadth of the squares being determined by the diagonal line running to the point of distance where it cuts through the lines of the pavement, which run to the point of sight, the farther this point is removed the more level the ground will appear, as represented in Figure 12.

ANGLES.

What we have hitherto said more immediately applies to parallel perspective, so named from all the lines which intersect those running to the point of sight being parallel with the base line. When,

* The truth of this may be also clearly proved if a person holds up a piece of glass on which a series of lines are drawn, radiating from the centre; for, by looking through it either up a street, avenue or long room, he will perceive those lines of the pavement, buildings, etc., which are at right angles with the base line, fall in with and cover many of the lines so drawn upon the glass, for as they all run to the point of sight, they will of necessity converge, since the spaces between them diminish as they recede from the spectator.

Fig. 8.

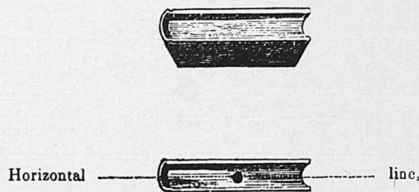


Fig. 9.

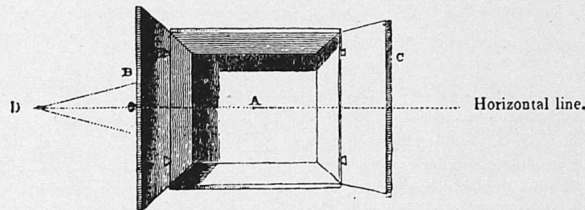


Fig. 10.

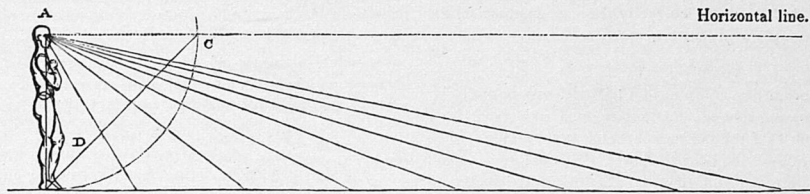


Fig. 11.

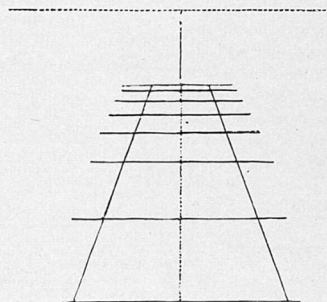
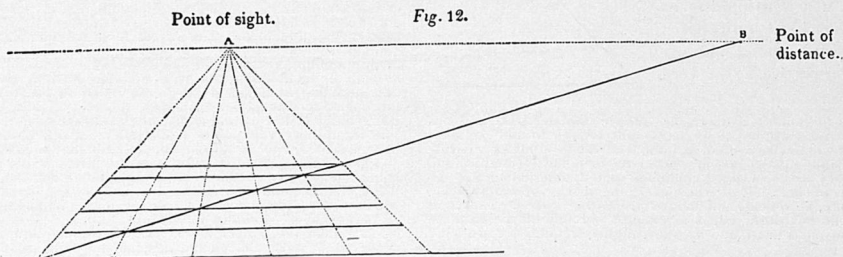


Fig. 12.



however, a square, or any cubical form, is viewed at the angle, the two sides will not appear to vanish in the point of sight, but run to two points on the horizontal line, called vanishing points; and this mode of treating the subject is called angular perspective. Now these two points are always at an equal distance from each other, which is one-fourth of a circle; therefore, if one is determined upon the other is easily found, for, as one departs from the point of sight the other appears to approach it, as any one may perceive by turning round a sheet of paper, or a book, from a situation where one side is parallel with the base line, until it is viewed upon the angle. The cause of this, perhaps, may be more clearly explained by Figure 13. Suppose the circle to represent the line of the horizon, which is the true representation of it when viewed out at sea, or where no obstruction intercepts it, for then the water, coming in contact with the sky, presents a circular horizontal line. If a person, therefore, was placed at D, and looking at the point A, the line C would be parallel with the base, being at right angles with A, and consequently occupying one-fourth of a circle; but if he turned in the direction of B, then A and C would become vanishing points, though still at equal distances upon the horizontal line, and would appear as in Figure 14. In a panorama, which is a circular canvas, viewed from the centre, this mode of measuring the various points is found to agree perfectly with the natural representation of objects.

CIRCLES.

If anyone takes a drinking glass or cup in his hand, with the mouth of it towards him, and gradually turn it from him, carefully watching it passing through all the elliptical forms, until the brim becomes a straight line in appearance, he will have a correct idea of

how it is that columns or other circular objects assume an oval shape at the top or bottom, according as they are below or above the eye; or, if he holds the cup with the side downwards and turns the mouth gradually towards him he will perceive the cause why arches, or circular gateways, appear elliptical in a side view. It arises from parts of the circle being more foreshortened than other parts: that is to say, those parts which come more in the line of the visual rays. For example: let a circle be divided into equal parts, and suppose the eye of the spectator placed at A, in Figure 15, those parts which lie in the direction of the rays of vision, B, occupy less space on the line C, which cuts through them, and when drawn on a flat surface would present an appearance like D, Figure 16. Or, imagine a line drawn through the centre, parallel with the base line, and which accordingly retains its exact length, those portions of the circular line

which lie in the same direction are less diminished, while the other parts, lying in an opposite direction, naturally become subject to the greatest degree of foreshortening, as in Figure 17.

Having now gone through the several forms of a triangle, square and circle, I shall here recapitulate the influence of perspective upon

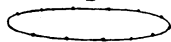
their various lines. We have seen that lines are shortened according as they fall in the direction of the visual rays, and retain their original length only when they cut them at right angles. Now this takes place wherever the objects are placed, whether near the foreground or in the distance; the eye of the spectator being a point from which imaginary lines radiate in any direction, and which are termed rays of vision, and along which imaginary lines all objects are received upon the retina; * and though in painting we are obliged to delineate everything upon a flat surface, yet, properly speaking, the line which cuts through these rays at equal distance from the eye is circular. We have seen, also, that all objects diminish in size according to their distance from the spectator, and that this diminution is more or less sudden according to the closeness of the spectator to the object. Upon this matter the taste and judgment of the artist is shown, because, though true according to nature, yet it may be represented with a very bad effect, and one figure of a group or one column of a row may be rendered preposterously large, so as to offend the eye, which, though at all times pleased with the truth, yet will be more delighted when that truth is rendered agreeable.† When this distortion takes place in reality, we naturally change our position until the eye is satisfied; but in painting, the whole being a flat surface, we change our position in vain.

We have also seen that all horizontal surfaces of objects diminish in breadth as they approach the horizontal line, and regain their true width when they depart from it, either by being immediately above the eye or directly under it, as may be perceived by Figure 18. Now this rule applies to all flat surfaces, whether approaching the horizontal line, in consequence of their distance from the spectator, or from being placed at different degrees of height; for, if they reach the eye in the direction of an angle of forty-five degrees, which is equidistant between a perpendicular and a horizontal line, they will be diminished in apparent width exactly one-half; if they are viewed at a greater or smaller angle, they will increase or diminish in the same degree. This is also the cause why surfaces of objects whose lines, at right angles with their base line increase in length as they depart from the point of sight, either to the left hand or to the right, as may be seen by turning the diagram round, making the line on which the eye of the spectator is placed a horizontal line instead of a perpendicular. This may appear too much a repetition of what has already been said respecting the cause of objects becoming foreshortened; but as it is the base on which all rules for true drawing are founded, it must be viewed in every position that the student may thoroughly comprehend it.

When the mind of the student is informed of the various causes operating on lines so as to change their appearance to the eye, let him look abroad upon natural objects, and contemplate the various changes produced in their forms by their situation, so that his eye may become familiar with those alterations in form and his mind enriched by a variety of examples, thus making nature furnish him with a thousand diagrams, which he ought to draw and write down his remarks upon. He will, by this method, not only educate his eye, but improve his mind at the same time, the study of drawing being intimately connected with observation and reflection.

Having now endeavored to explain the leading principles of perspective, I shall proceed to put them into practical application; but I must premise that it is an essential requisite before proceeding to delineate an object, that we make ourselves thoroughly acquainted with its general character; otherwise the eye cannot convey to us its image distinctly, neither can the hand render it with energy or

Fig. 16.



* Kepler, who, in 1600, was the discoverer of the seat of vision on the retina, says: "as to the images of objects being inverted in the eye, it is the business of the mind to trace the progress of them through the pupil, and refer them to those places of the objects themselves from which they seem to have proceeded."

† Reynolds, in a note upon Tresnay's Art of Painting, says: "the rules of perspective, as well as all other rules, may be injudiciously applied, and it must be acknowledged that a misapplication of them is but too frequently found even in the works of the most considerable artists. It is not uncommon to see a figure on the foreground represented near twice the size of another which is supposed to be removed but a few feet behind it; this, though true according to rule, will appear monstrous. This error proceeds from placing the point of distance too near the point of sight, by which means the diminution of objects is so sudden as to appear unnatural, unless you stand so near the picture as the point of distance requires, which would be so near for the eye to comprehend the whole picture; whereas, if the point of distance is removed as far as the spectator may be supposed to stand in order to see commodiously, and take within his view the whole, the figures behind would then suffer under no such violent diminution."

Fig. 13.

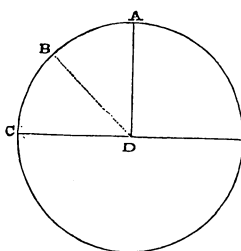


Fig. 14.

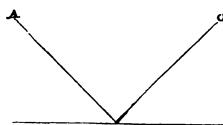
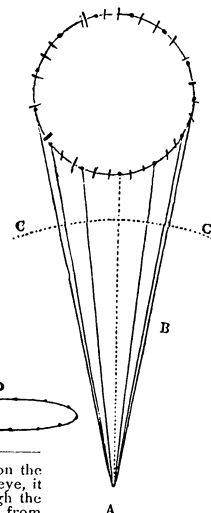
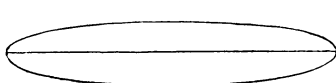


Fig. 15.



decides their character, so a knowledge of that variation enables us to give a true representation."

Fig. 17.



precision. Let us take, for example, the human face, the component parts of which everyone is acquainted with, yet the meshes of distinction in the several features few eyes can perceive or render with perfect accuracy. This oftener arises from a want of due examination, so as to be able to guide the eye, than from any deficiency in the eye itself; hence, we perceive in the drawings of children and rude nations a profile with the eye represented as if viewed in front, or a full view of the face with the nose as if seen in profile. To avoid such incongruities, therefore, the eye must be taught to see the changes which take place and the mind be made acquainted with the causes of such change.‡ In illustration of which, if we take a plaster cast or mask of the face, such as is represented in Figure 19, and draw a line down the centre, from the forehead to the chin, we perceive, when viewed directly in front, that it presents a straight perpendicular line, as in No. 1, though actually full of undulations from passing over the entire profile, but as these projections and recessings of the line are immediately under each other, they reach the eye in the same manner as if a string was held up before the mask in a perpendicular direction. If, however, the mask is viewed when turned half way round, between a profile and front face, as in No. 2, those parts of the line which recede or project will assume exactly one-half of their true character and projection; while, in profile No. 3, the line acquires its exact

similitude from its being undisturbed by those laws which regulate perspective. If we were to proceed and examine every feature in the same manner, we should find that the same laws lead us into a correct view of the alterations which take place upon every alteration in position. To explain this more clearly: if we take the mask and hold it with the chin towards us, so as to observe the curve on which the mouth is placed, as in figure 20, we can easily perceive that a person viewing it in the direction of the lines A, B, which would give him a view of the face between a front and profile (or what is termed by artists a three-quarter), would see one side of the lip of its entire length, while the other side, lying in the direction of the visual rays, would be reduced to a very small space, as may be perceived by its breadth on the ideal line, C, which cuts such rays at right angles. Such, also, is the case with the nose, in the same view of the face; one side remains undiminished, while the other side forms a mere outline, being seen entirely under the influence of perspective.

In finishing this part of the Essay I cannot conclude without reminding the pupil of the extreme importance of the very first preliminaries of the work, teaching the eye the power of measuring the distances between several points, as it is the basis of correct drawing. In drawing a head, if the points where the eyes, nose and mouth ought to be placed can be correctly put down, one of the greatest difficulties will be conquered, and the detail of which each feature is composed rendered easy and effective; § and the same remark applies to the power of combining the several parts of the largest assemblage of objects. The eye marks the distance of one or two leading points, which serve as a station to start from, and by a careful combination of exact dimensions moves over the whole space with a species of ideal trigonometry. Being also educated to observe the variations of the several lines, according as they are more or less under the influence of perspective, acting upon their

‡ Mengs, speaking of design, which he defines as comprehending the outline or the circumference of things, including the proportion of their length, breadth and form, says: "this part is composed of two principal divisions, the knowledge of the proper form of a thing and the manner of seeing it; the one depending upon geometry, the other upon optics. The first implies a knowledge of their optical appearance from the view presented to the sight; this pictorial geometry is necessary to enable the student to delineate with correctness and feeling, and which can only be acquired by careful habit of seeing and drawing with attention. This is the fundamental basis of design, without which it will be impossible to render theoretic knowledge available; for, as in painting, we must express the forms which we see in nature as they present themselves to our sight, and as their beauty depends upon that little more or less which decides their character, so a knowledge of that variation enables us to give a true representation."

§ Reynolds, speaking of Franz Hals, says: "in his works the portrait painter may observe the composition of a face, the features well put together, as the painters express it, from whence that strong marked character of individual nature, which is so remarkable in his portraits, and is not found in an equal degree in any other painter. If he had joined to this most difficult part of the art a patience in finishing what he had so correctly planned, he might justly have claimed the place which Vandyck, all things considered, so justly holds as the first of portrait painters." In another place he says: "the likeness of a portrait consists more in the preserving of the general effect of the countenance than in the most minute finishing of the features, or of any of the particular parts."—Sixth and Fourteenth Discourses.

form or size, a clear defined outline will be the result; not only unattainable by any other method, but even if attained, unaccompanied by the power of judging of its correctness.

(Continued next month.)

THE METROPOLITAN MUSEUM EXHIBITION.

THE fall and winter exhibition at the Metropolitan Museum opened on November 2d.

A fine and interesting loan collection has been got together, as well as some recent valuable gifts now for the first time shown. Mr. Joseph W. Drexel has given a collection of ancient musical instruments, the friends of the late W. H. Huntington, of Paris, a fine bronze equestrian statue of Washington, the British Museum two cases of casts of antique bas-reliefs, and the Hon. Levi P. Morton a fine set of medals commemorating the victories and campaigns of Napoleon I. The medals were struck off at Mr. Morton's request at the French national mint, and vary in size from two inches in diameter to the size of a five dollar gold piece. The Museum now owns quite a fine collection made and presented it by Mr. Huntington, which

like Mr. Bierstadt's "Donner Lake," Mr. William E. Marshall's colossal "Head of Christ" and the "Valley of the Var," by the late Henry C. Bispham, will be readily recognized. Mr. Marshall also shows his portrait of Lincoln, the original of the well-known engraving. A painting by the late Hans Makart, "Midsummer's Night Dream," will attract attention, although it cannot be counted a favorable example. There are several pictures by the late W. M. Hunt, and portraits by the late William Page, George A. Baker and John Pope, the latter being represented by an admirable three-quarter length of Daniel Webster. Mr. J. Rolin Tilton, an artist of no inconsiderable reputation in the American colonies of Florence and Rome, sends a somewhat disappointing view of Grenada and the Alhambra. The principal lenders besides those already noted are Messrs. James W. Pinchot, S. Michelbacher and the estate of Professor Morse.

The Museum has received a bequest of \$10,000 for the purchase of casts of Greek sculptures. These will be set up in what is now the great hall when the additions to the Museum are completed.

includes bronzes, prints and paintings. Among the latter is to be noted a portrait of Benjamin Franklin, painted by T. Elmer in 1782, and one of Washington by Charles Wilson Peale. The picture has historic interest. It was taken in France in 1788 by M. de la Boissiere, the aide-de-camp to Gen. Rochambeau, and was purchased by Mr. Huntington from a descendant of M. de la Boissiere. Two other recent donations are "The Entombment," by Alphonse Colos, a gift of Mr. L. A. Lanthier, and "Christ Healing the Sick," by Dietrich (1774), a gift of Mr. W. H. Webb. Among the pictures lent for exhibition are two Rembrandts, one Nicholas Poussin and one Spagnoletto. Mr. John Bigelow presents the Museum with 660 books and pamphlets relating to Benjamin Franklin, collected by Mr. Huntington. The trustees of the Boston Museum of Fine Arts send two cases of casts of bas-reliefs discovered at Assos. The Museum has received from Mr. R. M. Hunt a small painting by Albert Cuyp, and from ex-Governor John L. Manning a painting by Pannani.

A noteworthy exhibit is a collection of Japanese earrings in ivory, lent by Mr. Joseph B. Stearns. It fills two large cases, and is said to be the finest collection in the world. Japanese art is exhibited in all its grotesqueness and skill. Toads and lizards leer at you over the shoulders of the almond-eyed Jap, and dragons, with all the traditional appendages of that animal, are omnipresent. The tintings of all the figures are wonderful. The ivory is made to look like the scale of a marine monster, the face of a man, or the wooden blade of a water wheel. The exhibition in the second gallery may almost be termed historical as regards the American paintings. An admirable portrait of De Witt Clinton, by C. C. Ingham, and "The Origin of the American Flag," by Henry Peters Gray, take us back into a past generation. The landscape by Regis Gignoux appropriately accompanies an evening scene by Mr. George Inness, who spent a short time in M. Gignoux's studio. Some of the largest pictures,

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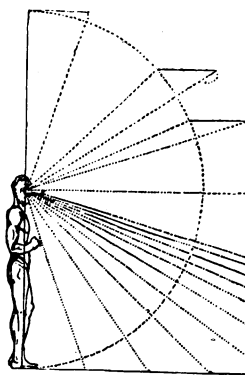


Fig. 18.

Horizontal line.

Fig. 19.

No. 1.

No. 2.

No. 3.



IN response to numerous inquiries from subscribers who neglected to obtain Mr. Shirlaw's etching with their first subscription, we would like to announce that any one whose name is on our subscription books can, by the payment of \$2.00 more, obtain a copy of "The Reprimand." The price of "The Reprimand" to non-subscribers is \$7.00.

Fig. 20.

